US Army Corps of Engineers ®
Portland District

Draft Environmental Assessment

CASPIAN TERN NESTING HABITAT REDUCTION ON EAST SAND ISLAND CLATSOP COUNTY, OREGON

INTRODUCTION

Since the late 1990's the U.S Army Corps of Engineers (Corps), Portland District has been researching, monitoring and managing Caspian terns, also referred to as "terns" (all scientific names in Appendix 1) on islands the Corps owns and/or uses to dispose of dredged material in the Columbia River Estuary. Caspian terns first nested on East Sand Island in the Columbia River Estuary in 1984 following the deposition of fresh dredged material at the eastern tip of the island in 1983. By 1985, vegetation covered the East Sand Island nesting site, and by 1986 the tern colony had shifted to Rice Island, a dredged material disposal site 16 miles upstream. In 1999 and 2000, the Corps socially attracted the terns, using decoys and playing pre-recorded callbacks, from Rice Island back to East Sand Island. East Sand Island is owned and managed by the Corps. This relocation was done to decrease the numbers of juvenile salmon and steelhead consumed by the terns to meet the Corps' commitments made in consultation under the Endangered Species Act (ESA) with the National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NMFS 2008).

Early studies on the diet of Caspian terns nesting on Rice Island indicated their consumption of juvenile salmonids was nearly 2 to 3 times higher when compared to similar numbers of birds nesting on East Sand Island (Roby et al. 2002). Based on these studies, East Sand Island is generally considered to be the best location for piscivorous (fish-eating) water birds in the estuary in terms of their reduced impacts to juvenile salmon because it is closer to the Pacific Ocean and supports greater abundance and diversity of forage fish (anchovy, herring, smelt, shad, sardine, Pacific sand lance, etc.) (Roby et al. 2002). Terns prey upon these forage fish when available, thus reducing the proportion of salmonids in their diets (Figure 2).

In 2000, the Corps was working to complete a project to socially attract the Caspian terns to East Sand Island and preclude nesting on Rice Island. This work was challenged under the National Environmental Policy Act (NEPA) by Seattle Audubon Society, National Audubon Society, American Bird Conservancy, and Defenders of Wildlife. In 2002 the parties involved in the lawsuit reached a settlement agreement. The 2002 settlement agreement allowed for the continuation of the efforts to socially attract the birds to East Sand Island but also required the Corps, U.S. Fish and Wildlife Service (USFWS), and

NMFS to produce an Environmental Impact Statement (EIS) to develop a plan for managing the terns in the long term with the goal of reducing predation on juvenile salmonids. Subsequently, these federal agencies completed the *Caspian Tern Management to Reduce Predation of Juvenile Salmonids in the Columbia River Estuary Final Environmental Impact Statement*, also referred to as the "FEIS" (USFWS et al. 2005). The USFWS and Corps each issued their own records of decision (RODs) in 2006 (USFWS 2006; Corps 2006). These 3 documents are collectively referred to in this document as the "Caspian Tern Plan."

Figure 1. Vicinity Map of East Sand Island, Rice Island, Miller Sands Spit and Pillar Rock Island in the Columbia River Estuary. The Corps manages these islands for placement of dredged material.

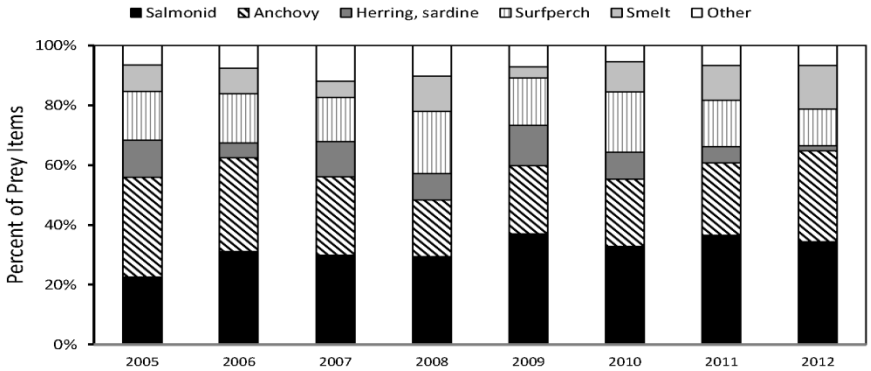

Figure 2. Annual diet composition (percent of prey items) of Caspian terns nesting on East Sand Island during 2005-2012 nesting seasons based on fish identified on the colony in bill loads (Roby et al. 2012 Annual Report). The varied diet is attributable to the close proximity of East Sand Island to the ocean. Data for 2013 not yet available.

Caspian Tern Plan

The Caspian Tern Plan called for redistribution of approximately 60% of the East Sand Island colony population via construction of new habitat (islands) in Oregon, California, and Washington. Reduction of habitat on East Sand Island would be contingent upon creation of the new islands at an area ratio of 2:1. Because Caspian terns nested on an average of 4.4 acres from 2001 to 2004 on East Sand Island (range from 3.9 to 4.7 acres), approximately 6-7 acres of new suitable habitat would need to be created to reduce the East Sand Island habitat from between 1 to 1.5 acres (USFWS et al. 2005). This acreage on East Sand Island was selected because it was assumed it would be adequate to reduce the number of breeding pairs down to a range of 2,500- 3,125 and that a smaller Caspian tern colony on East Sand Island would achieve an overall increase in salmonid population growth rates (USFWS et al. 2005). Islands constructed by the Corps to date are shown in Table 1; all are located east of the Cascade Range in southern Oregon and northern California except for Fern Ridge which is located in the southern Willamette Valley in Oregon.

Table 1. Corps constructed islands from the Caspian Tern Plan with 2013 Caspian tern nesting results (Roby et al. 2013).

State and Site Name	Land Owner	Available Area (Acres) in 2013	Estimated Number of Nesting Pairs in 2013	Fledglings Produced
OREGON				
Fern Ridge Lake, Lane County	Corps	1 acre	0	No
Gold Dike Lake, Summer Lake Wildlife Area, Lake County	ODFW	0.5 acre	0	No
East Link Lake, Summer Lake Wildlife Area, Lake County	ODFW	0.5 acre	21	Yes
Crump Lake, Warner Valley, Lake County	ODSL	1 acre	223	Yes
Dutchy Lake, Lake County[1]	ODFW	0	0	No
Sheepy Lake, Klamath Basin NWR, Klamath County	USFWS	0.8 acre (floating)	316	Yes
Orems Unit, Klamath Basin NWR, Klamath County	USFWS	0.2 acre (1 acre built but 0.8 acre dry)	0	No
Malheur Lake NWR, Harney County	USFWS	1 acre	530	Yes
California				
Tule Lake, Klamath Basin NWR, Siskiyou County	USFWS	1.35 (2 acres built but 0.65 acre dry)	79	No
Totals		6.35 acres	1,169 Nesting Pairs	

[1] Removed from the program because of unsuitable conditions for nesting.

Acreage of the Klamath Basin sites listed in Table 1 were not found to be fully suitable as defined in the FEIS and, therefore, only portions of the sites were counted.

Predators at the sites listed in Table 1 have included gulls, great-horned owls, black-crowned night herons, raccoons, foxes, mink, coyotes, opossums, and skunks.

Habitat area was not considered of utmost importance, but was used in determination of mitigation ratios under assumptions of certain nesting densities. Responsible management of Caspian terns, while considering predation on juvenile salmonids listed under ESA, must address colony size in terms of numbers of nesting pairs more so than area of nesting habitat provided. Islands provided for terns are, of course, not year-round habitat as these birds are highly migratory but serve only to provide space for nesting colonies during spring and summer.

Before the Corps' ROD was signed, plans for the creation of habitat in Washington State were unattainable, and a modified alternative was selected which involved constructing 7 acres of new habitat and ultimately reducing East Sand Island habitat to 1.5 to 2 acres. It was expected that reducing East Sand Island habitat by this amount would result in an estimated colony size of 3,125 to 4,375. Through identification and creation of new habitat, the acreage on East Sand Island could ultimately be reduced to 1 acre if other alternative sites are found, enhanced, or created. Potential coastal relocation sites that had been considered in Oregon were also deemed unsuitable because of concerns over introducing predation on fish stocks that had not been historically subjected to Caspian tern predation; thus these coastal sites were not incorporated into alternatives considered in the FEIS. Creation and/or enhancement of site(s) along the coast would likely provide habitat for large colonies because of food availability, without having large concerns from the perspective of ESA.

In 2008, implementation of the Caspian Tern Plan began. Over the last 4 years, the Corps has constructed 8.3 acres of new habitat to compensate for habitat reduction which has occurred over that time on East Sand Island. Dutchy Lake (0.5 acre) was eliminated from the program in 2012 because of unsuitable nesting conditions due to submergence, leaving the current inland habitat acreage at 7.8 (Table 1). In 2012, available habitat for the Caspian tern colony was reduced to 1.58 acres on East Sand Island (Figure 3). Habitat reduction is accomplished by allowing vegetation to grow in naturally. Every year the designated colony area is prepared by tilling the soil and removing the encroaching vegetation to achieve the desired nesting habitat for the terns (Figure 4). Implementation of the plan calls for the USFWS to monitor the tern's regional population to ensure the conservation goals for Caspian terns are being met.

The Corps' 2006 ROD was incorporated into the 2008 Federal Columbia River Power System (FCRPS) Biological Opinion (BiOp) (NMFS 2008) as reasonable and prudent alternatives. This requires the Corps to monitor and report to NMFS the number of acreage available and breeding pairs on East Sand Island and on the newly constructed islands and report on the consumption rates on juvenile salmonids at East Sand Island.

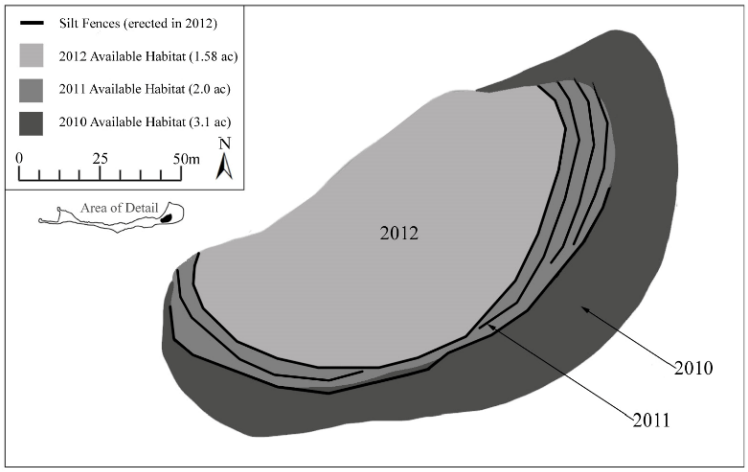

Figure 3. Nesting habitat acreage prepared for Caspian terns on the eastern end of East Sand Island in the Columbia River Estuary from 2010-2012.

Figure 4. Caspian Tern Colony on the eastern portion of East Sand Island, 2012. Silt fences in vegetated areas show former boundaries of the colony.

Adaptive Management

Recognizing the difficult and often unpredictable situation of trying to manage the largest colony of Caspian terns in the world, the Caspian Tern Plan called for an adaptive

management plan. In 2012, an inter-agency Adaptive Management Team (AMT) began meeting to discuss the effectiveness of the plan and to make recommendations to the Corps on taking new courses of actions. These recommendations are based upon the responses of Caspian terns to management efforts. Members of the AMT include USFWS, NMFS, Corps, and the Bonneville Power Administration (BPA); BPA funds the monitoring of terns on East Sand Island.

Predictions were made in the Caspian Tern Plan on how many nesting pairs would occupy a reduced habitat. Based on previous nesting densities on East Sand Island and Rice Island, it was expected that the 1.5 to 2 acres of prepared habitat would be adequate to provide for a colony range of 3,125 to 4,375 breeding pairs (Corps 2006). It was also believed that the proposed acreage and associated colony size would be suitable to encourage social attraction and prevent colony abandonment (USFWS et al. 2005).

During implementation of the Caspian Tern Plan, the response from Caspian terns was unexpected as to how many nesting pairs would occupy available habitat. In 2012, nesting density at the East Sand Island tern colony increased to 1.06 nests per square meter which was the highest nesting density ever observed at this colony (Roby et al. 2013). In 2013, density was even higher, at approximately 1.2 nests per square meter; approximately 7,600 nesting pairs (plus or minus approximately 600 nesting pairs) occupied the space that was intended for 3,125-4,375 pairs (Roby et al. 2013).

Caspian terns have also attempted (and have had limited success in nesting) along the eastern shore of East Sand Island outside of the designated 1.58 acre colony area (Roby et al. 2012 Annual Report). Hazing of Caspian terns, which involved placement of flags to modify suitable habitat and prevent nesting, was implemented with success on East Sand Island with the intention of containing the colony to the designated and maintained area.

One factor not anticipated in the Caspian Tern Plan and of immediate concern to the AMT is the impact native predators are having on the colony's productivity (number of young raised per breeding pair). The nesting seasons of 2010 through 2012) showed low productivity for the colony. In 2011, the colony did not produce a single fledgling (Figure 5). The low productivity in 2011 and 2012 of the Caspian tern colony was caused primarily by egg predation by glaucous-winged x western gull hybrids that consumed tern eggs and chicks after bald eagles flushed the adults from the colony (Roby et al. 2012 Annual Report). This most often occurred in the evening, which increased the occurrence of adult terns leaving the colony until the next day, making eggs and nestlings even more susceptible to additional predation. The threat of adult mortality, as with bald eagle disturbance, also can cause permanent nest abandonment (Cuthbert 1988). Nest predation is considered to be a primary factor influencing Caspian tern production and

nest-site fidelity (Cuthbert 1988; Danchin et al.1998; Strong et al. 2004).

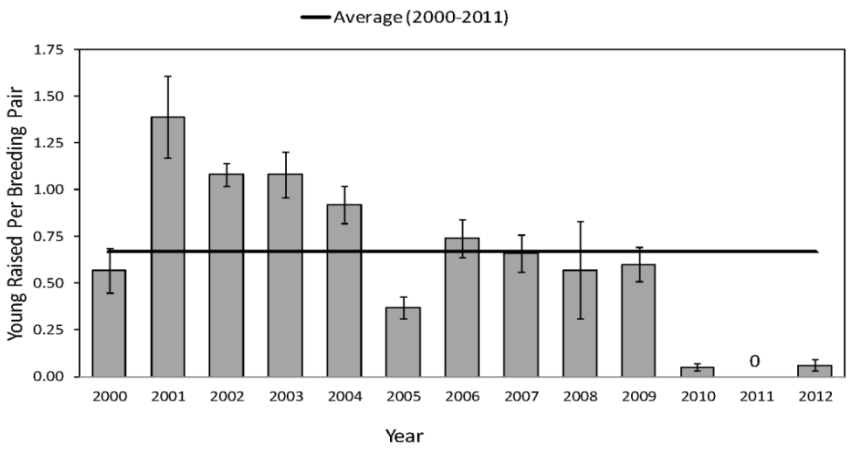

Figure 5. Caspian tern nesting success (average number of young raised per breeding pair) at the breeding colony on East Sand Island in the Columbia River Estuary during 2000-2012 (Roby et al. 2012 Annual Report). The error bars represent 95% confidence intervals. Data for 2013 not yet available, but estimate was approximately 0.2 young raised per breeding pair.

In 2012 the Corps lethally removed 50 glaucous-winged x western gull hybrids under a permit from the USFWS. The lethal removal of gulls began on May 5, 2012 and lasted until June 15, 2012. Despite efforts to remove predatory gulls, terns had very little reproductive success, raising only 400 young for the entire colony of 6,400 pairs. When the allowable number of gulls was removed in 2012, there was still a considerable amount of tern nest predation by gulls. Caspian terns increased on the colony at East Sand Island in 2013 to approximately 7,600 pairs with the number of young raised per nesting pair increasing to near 0.2 (Roby et al. 2013).

Caspian Tern Management Upstream of East Sand Island

To address concerns about the terns' potential to go upriver and consume greater numbers of salmon, the Caspian Tern Plan called for hazing at Rice Island, Miller Sands Spit, and Pillar Rock Island. The Corps uses these islands on a semi-regular basis to place dredged material, thereby creating suitable temporary open sand nesting habitat for the terns. Hazing was also a requirement of the BiOp for Columbia River channel operations and maintenance (NMFS 2005).

Recent efforts to haze the birds have only been necessary on Rice Island, as the birds have not exhibited nesting behavior on Miller Sands Spit or Pillar Rock Islands (Roby et al. 2012 Annual Report). Rice Island and Miller Sands Spit are the two most likely places Caspian terns may seek out for roosting or nesting as relatively recent placement of dredged material and clearing for that placement have created some suitable habitat. Caspian terns have used Rice Island and Miller Sands Spit for roosting and adjacent

waters for foraging but their use of the islands in this way, as observed by monitors and hazers, has been limited to the mud flats.

Placement of material on Miller Sands Spit occurs on annual or bi-annual basis and typically only on the shore where it erodes through natural processes. In 2012, dredged material placed on Miller Sands Spit was contoured to establish mounds that were effective in making the newly created habitat less suitable for nesting. This was related to limiting sight distance of terns when perched on the ground.

Methods used on Rice Island have primarily consisted of using silt fence and flagging to modify suitable nesting habitat for terns (Figure 6). Hazing efforts also include presence of humans (hazers) to flush the birds away from the island. The Caspian Tern Plan also called for other measures to prevent terns from using these islands, such as establishing vegetation to make habitat unsuitable for nesting, using eagle kites, personnel with dogs, and all terrain vehicles to cover distances effectively. These efforts begin April 1 and continue to June 15 each year (USFWS et al. 2005).

To assist in preventing the establishment of new tern colonies on Rice Island, Miller Sands Spit, and Pillar Rock Island, the USFWS (per the Caspian Tern Plan) would issue a depredation permit annually to the Corps to collect eggs, should hazing with non-lethal methods fail to prevent tern nesting. Since the implementation of the Caspian Tern Plan, a total of 10 eggs have been collected under permit, all from Rice Island. The Corps was issued a permit to collect 100 Caspian tern eggs each year from 2009 to 2013.

Figure 6. Wood stakes with rope and flagging used to make Caspian tern nesting habitat unsuitable on Rice Island.

Periodic boat-based and aerial surveys of Rice Island, Miller Sands Spit, and Pillar Rock Island are conducted annually during the breeding season in order to detect signs of nesting attempts by Caspian terns. In May of 2009, 1 year after implementation of the

Caspian Tern Plan, approximately 520 Caspian terns were observed loafing on upland areas of Rice Island, and their observed behavior (courtship displays, exchange of courtship meals, copulations, and digging of nest scrapes) indicated an intention to nest (Roby et al. 2010 Annual Report). Stakes and flagging were put out in these areas, and terns were successfully dissuaded from nesting. The following year in May, approximately 75 Caspian terns were observed in an upland area east of the old colony site on Rice Island and were again effectively hazed off the island by placing stakes and flagging on the island (Roby et al. 2011 Annual Report).

In April of 2011, Caspian terns appeared interested in nesting at Rice Island near the former colony site that was used in the 1990s and on a pier at Tongue Point. Stakes and flagging were erected in the areas where terns were attempting to nest, and human hazers were on the island attempting to keep the birds off until June 15 when hazing ended. Caspian terns returned to Rice Island in late June and initiated nesting there. In July, 3 Caspian tern nests, with a total of 4 eggs, were discovered on Rice Island adjacent the old colony site and near areas that had previously been staked and flagged to prevent tern nesting. In August, approximately 460 adult Caspian terns (most were roosting) and 3 tern chicks were observed at the colony site on Rice Island (Roby et al. 2012 Annual Report). In 2012 and 2013, efforts to dissuade terns from nesting on Rice Island were successful.

Current Hazing Operations

Caspian tern hazing occurs annually on Rice Island, Pillar Rock Island, and Miller Sands Spit in the Columbia River Estuary upstream of East Sand Island. Two sessions of monitoring have occurred each day of monitoring; once in the morning (beginning before 8:00 AM) and once in the afternoon (beginning after 2:00 PM). A total of 27 days of monitoring occur from April 16 through June 15, the peak nesting season for Caspian terns. Patrols begin April 16 and occur every three days until May 1 when they are done every other day, until June 9 when they occur every three days until the 15 of June. Observation of Caspian terns are done by monitors using binoculars to scan the islands. Monitors access the island by boat.

Specific hazing actions for each island are as follows:

<u>Monitoring on Rice Island-</u> During both am and pm shifts of each monitoring day; monitors access Rice Island and walk from the southwest corner in a northeasterly direction to the north shore of the island while scanning for Caspian terns. The high points of Rice Island are accessed during one of the sessions per week and the island scanned for Caspian terns.

<u>Monitoring on Pillar Rock Island-</u> During both am and pm shifts of each monitoring day; monitors access Pillar Rock Sands on the north shore and walk to a point south where the whole dredge spoil area can be scanned for Caspian terns.

Monitoring on Miller Sands Spit- Only requires access by foot if Caspian terns are seen from the boat attempting to nest. Caspian terns are immediately dissuaded from nesting by installing wooden stakes at least 3 feet tall with 4-mil flagging secured to the stakes in the areas of attempted nesting; one flag per stake with a length after tying of a minimum of 2 feet. Stakes are placed a minimum of 10 feet apart. Yellow poly rope shall be used in conjunction with the flagging for this dissuasion. It is likely that the area per dissuasion event would involve a minimum of 0.25 acre and up to a maximum of 3.0 acres of staking and flagging.

In addition to hazing, collection of up to 100 Caspian tern eggs occur only under USFWS Migratory Bird Permit. Eggs are collected only from Rice and Pillar Rock Islands and Miller Sands Spit and be refrigerated for delivery to the Corps or Oregon State University representatives.

STATUS OF CASPIAN TERN MANAGEMENT

The Caspian Tern Management Plan has been implemented with some success. To date, habitat creation and enhancement in interior Oregon and California has allowed for incremental reduction in Caspian tern nesting habitat on East Sand Island. These inland sites are listed in Table 1. Nesting success has varied among sites due to habitat suitability, forage fish availability, and predation on eggs and chicks.

Management of Caspian terns in the Columbia River Estuary is intrinsically challenging because of the need to satisfy competing interests; the well being of the Caspian tern colony in the Columbia River Estuary and the ESA-listed salmonids upon which they prey. The East Sand Island Caspian tern colony is the largest in the world in terms of nesting pairs and is atypical in size; the colony supports the majority of the Pacific Regional Population. The Caspian Tern Plan targeted approximately 3,125 to 4,375 nesting pairs on East Sand Island with reduction of nesting habitat to between 1.5 and 2 acres, resulting in a predicted 1 percent or greater increase in population growth rates for 4 Columbia River Basin steelhead ESUs. Steelhead were used in model predictions because they are more susceptible to tern predation than other salmonid ESUs in the Columbia River Basin. Reduction of nesting area available for terns on East Sand Island has not produced the desired results of diminishing the tern population there, however. Numbers of nesting pairs have remained high because of the unexpected increased density of nesting pairs on the colony, which were approximately 7,600 (plus or minus approximately 600) in 2013 (Roby et al. 2013). It is unknown if further reduction to the size of the nesting colony on East Sand Island would result in even greater density of nesters; no studies have attempted to determine the minimum area required for a nesting pair. Greater nesting densities on East Sand Island are conceivable, however, because of densities recorded on Crump Island, which were slightly higher than those seen in 2013 on East Sand Island. From comparing Figures 8 and 12, numbers of nesting pairs appears to be a good predictor of numbers of juvenile salmonids consumed.

PURPOSE AND NEED FOR ACTION

Purpose:

The purpose of the Proposed Action is to address actions called for in the 2008/2010 FCRPS BiOp. Reasonable and Prudent Alternative (RPA) 45 requires implementation of a Caspian Tern Management Plan and RPA 66 requires evaluation of the effectiveness of the plan. The proposed action is considered adaptive management towards meeting the purpose and need of the EIS/ROD and fulfilling expected salmonid survival improvements per the FCRPS BiOp.

Need:

The actions taken per the FEIS and Corps' ROD did not result in the anticipated reduction of consumption of juvenile salmonids by Caspian terns. The amount of nesting habitat available to Caspian terns on East Sand Island has declined since 2006 from about 6.5 acres to the current 1.58 acres. Year 2013 marked the third year that Caspian tern habitat was managed between 1.58 to 2.0 acres. This reduction was expected to result in 3,125 - 4,375 nesting pairs (ROD). Despite incremental reductions in the amount of nesting habitat, numbers of nesting pairs and amount of predation on juvenile salmonids have remained fairly constant. In 2013, at 1.58 acres of nesting habitat on East Sand Island, the number of nesting pairs was near 7,600 and predation on juvenile salmon was near 4.7 million (Roby et. al. 2013). Neither the FCRPS BiOp objectives for juvenile salmon survival nor the purpose and need of the EIS/ROD have been met. This indicates that additional actions are needed.

ALTERNATIVES

No Action Alternative: Continue Current Management

The No Action Alternative would continue the current management of Caspian terns on East Sand Island and the constructed tern colonies in interior Oregon and Northern California as defined by the 2005 EIS and 2006 ROD and as described above. Current management of terns on East Sand Island includes the following:

- Designate colony area: Delineate 1.58 acres of Caspian tern nesting habitat.

- Habitat quality: Habitat within the designated Caspian tern colony would be prepared to provide suitable nesting habitat. Site preparation may include eliminating vegetation and using a tractor and disk to till the site and smooth the surface prior to the nesting season.

- Haze on East Sand Island: Caspian terns attempting to nest outside of the designated colony would be hazed via non-lethal methods (passive hazing involving habitat modification supplemented by active human hazing) during the peak nesting season (March through mid-June). Passive hazing (e.g. placement of

stakes and flags) would not occur below mean higher high water since frequent inundation would prevent nesting.

- Haze in the Columbia River Estuary: Hazing Caspian terns from Rice Island, Pillar Rock Island, and Miller Sands Spit (all located upstream of East Sand Island) would continue under the Corps' dredging program and would allow for collection of up to 100 Caspian tern eggs on these island. Caspian tern would be prevented from nesting using passive and active non-lethal hazing methods, as described for East Sand Island above.

- Monitor on East Sand Island: Monitoring of the East Sand Island designated colony would occur while employing previously constructed blinds. Monitoring would include numbers of nesting pairs, productivity, presence and impact of predators, and predation on fish via bill load observations.

- Monitor at the constructed islands: On the constructed islands for Caspian terns in interior Oregon and northern California, social attraction, predator management, vegetation management, and monitoring would continue until the target colony size on East Sand Island (2,500 – 3,125 nesting pairs) is met.

- Seek coastal nesting site: Under current management, the Corps would continue searching for a viable coastal nesting site for Caspian terns and would not consider reducing Caspian tern nesting habitat on East Sand Island until a coastal site is identified and made available to terns.

Proposed Action: Reduce Designated Colony to 1.08 acres and Other Actions

This alternative would continue all of the activities described above in the No Action Alternative with the following exceptions:

- Designate colony area: The designated Caspian tern colony area would be reduced from 1.58 to 1.08 acres. Habitat reduction on the designated colony at East Sand Island would be achieved via placing temporary and removable barriers (sticks, flags, ropes, stakes, etc…) prior to the nesting season. If less than 3,000 nesting pairs are present (as determined by monitors) on the designated colony by July 1st, the barriers would be removed.

- Haze on East Sand Island: Because terns have expressed high nest fidelity over the course of management (terns that hatched or nested at East Sand Island returning to East Sand Island), an increased effort in hazing and habitat modification would likely be necessary on the eastern and western portions of East Sand Island especially during the during the peak nesting season: March through mid-June.

- Haze in the Columbia River Estuary: Hazing terns from Rice Island, Pillar Rock Island, and Miller Sands Spit would occur with greater intensity. Actions would

include collecting up to 100 Caspian tern eggs on these islands and preventing terns from nesting using non-lethal methods (habitat modification and human hazing).

- Seek alternative coastal nesting site: The Corps would continue searching for a viable coastal nesting site in 2014, while tern habitat on ESI is reduced.

AFFECTED ENVIRONMENT AND EFFECTS OF THE PROPOSED PROJECT

The primary description of the affected environment can be found in the FEIS. Further information is described below.

East Sand Island is located in the Columbia River Estuary near the mouth of the Columbia River in Clatsop County, Oregon, approximately 1 mile west of Chinook, Washington and 10 miles northwest of Astoria, Oregon. The island, approximately 50 acres in size, was once connected to Sand Island, just to the northeast in Baker Bay. The islands have separated over time due to erosion. In 1954, East Sand Island was transferred to the Corps for the Sand Island Channel Improvement Project.

Currently a variety of breeding seabirds and water birds nest on East Sand Island. Because of the large numbers and diversity of birds using the island, the American Bird Conservancy and the National Audubon Society recognize it as an Important Bird Area and Western Hemisphere Shorebird Reserve.

Miller Sands Spit and Rice Island, located upstream of East Sand Island in the Columbia River Estuary, are used regularly for placement of dredged material by the Corps and are characterized by large expanses of bare sandy ground with areas of sparse grasses, forbs and small shrubs. These islands are a unique, almost desert-like habitat in the estuary (USFWS 2010). Sparse vegetation and the scarcity of mammalian predators make the islands an attractive nesting location for Caspian terns and other colonial waterbirds such as glaucous-winged x western gull hybrids, pelicans, and cormorants. Control of mammalian predators has been necessary for establishment of inland Caspian tern nesting colonies, but has not been an issue with islands in the estuary. Canada geese and streaked horned lark also nest on these islands (USFWS 2010). The off-channel edges of the islands slope into shrubby willows and cottonwoods near the water's edge and then into tidal marsh and shallow flats. These shallows attract large numbers of wintering ducks, as well as migrating shorebirds and juvenile salmonids (USFWS 2010).

The Caspian terns' migration to the lower Columbia River Estuary has dramatically changed distribution of the Western Regional Population. Caspian tern breeding was first documented in the Columbia River Estuary in 1984 when approximately 1,000 terns were reported nesting on fresh dredged material disposed on East Sand Island. Prior to 1984, the species was a non-breeding summer resident of the lower Columbia River. In 1986, possibly because of vegetation development on East Sand Island, the colony moved to Rice Island where they nested until the Corps took an action to relocate the terns via

social attraction to East Sand Island, closer to the ocean, in order to decrease the percentage of juvenile salmonids in the diet of terns.

To compensate for reduction in area of the nesting colony on East Sand Island over the years, 8 inland nesting areas have been established for Caspian terns in Oregon and northern California (Table 1) totaling 7.8 acres. Of these 8 nesting locations, 5 were used in 2013 supporting a total of 1,169 nesting pairs. Of these 8 locations, 7 are east of the Cascade Range in Lake, Klamath, and Harney Counties in Oregon and Siskiyou County, California. One location is in the Willamette Valley in Lane County, Oregon.

Effects of the actions are described in the FEIS except as noted in this text.

ESA-listed Species and Caspian Terns:

Proposed Action:

Implementation of the Proposed Action would be considered a corrective measure to reduce predation on juvenile Columbia River Basin ESA-listed salmonids with the goal, per the Caspian tern plan, to redistribute ~60% of the tern population of the East Sand Island colony.

East Sand Island is the largest Caspian tern colony in the world (Roby et al. 2012 Annual Report) and approximately 60% of the Pacific coast regional population currently nests on East Sand Island (USFWS et al. 2005). The Pacific Regional Population has increased from approximately 6,218 pairs in 1976-1982 to approximately 11,660 in 2011 (Spendelow and Patton 1988; Corps 2013b).

Caspian terns nest on the eastern portion of the island and are separated from a cormorant colony on the western portion of the island by dense upland shrub habitat. The number of adult terns on the East Sand Island colony peaks in mid-May, which corresponds to the peak period of migration of juvenile salmonids (many released from upriver hatcheries) through the estuary (Figures 7 and 9). In 2012, however, Caspian terns remained on the colony in good numbers into August; this was likely because of intense gull depredation on chicks and eggs.

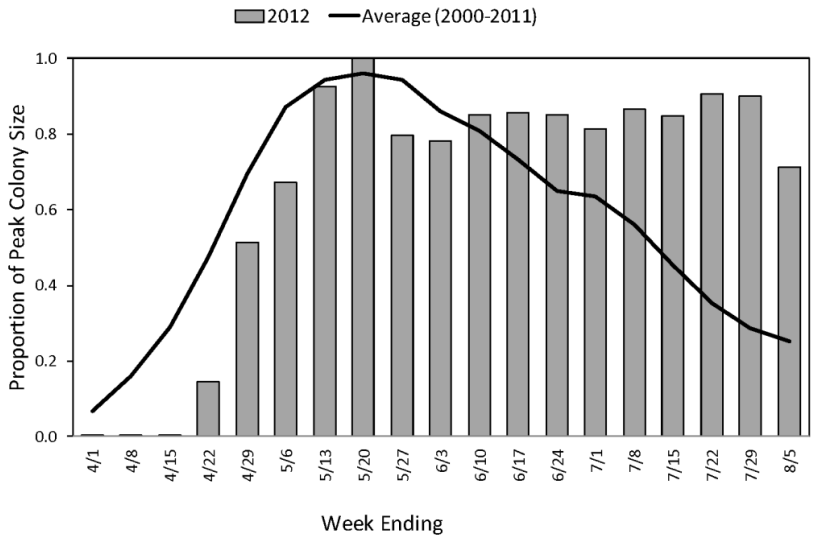

Figure 7. Weekly estimates from the ground of the number of adult Caspian terns on the East Sand Island colony during the 2012 breeding season, relative to peak colony attendance determined from counts of aerial photography taken late in the incubation period (Roby eta al. 2012 Annual Report). Data for 2013 not yet available.

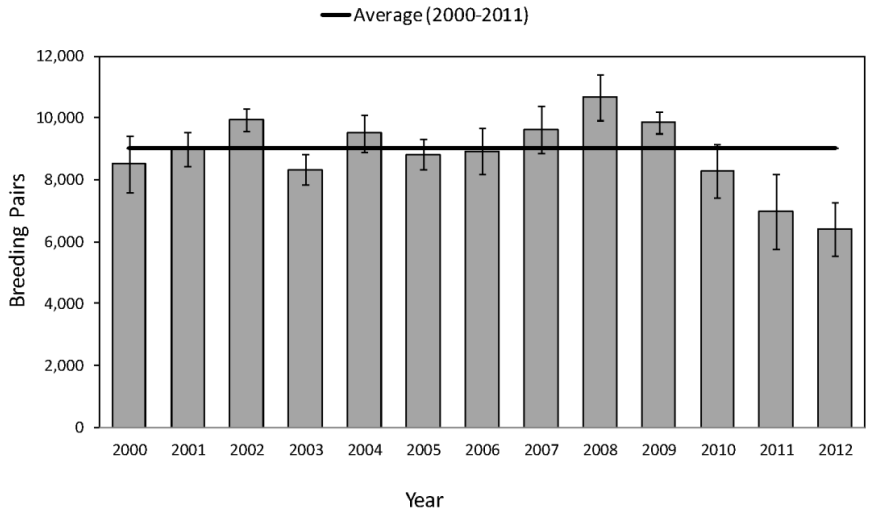

Figure 8. Number of breeding pairs of Caspian terns on East Sand Island (Roby et al. 2012 Annual Report). Data for 2013 not yet available, but estimate was near 7,600 (Roby et al. 2013). The error bars represent 95% confidence intervals.

The number of breeding tern pairs on East Sand Island peaked in 2008 and trended downward through 2012 (Figure 8) as colony size has gradually been reduced, but increased in 2013 despite nesting acreage remaining constant from 2012 to 2013. In the

past 3 years, the colony has experienced very low nesting success (Figure 5). In 2011, the colony did not produce any young; this was the only time that a complete breeding failure has occurred at this colony (Roby et al. 2012 Annual Report). The decline in productivity and colony size is attributed to intense disturbance by bald eagles and associated gull predation on tern eggs and chicks. In 2012, the Corps lethally removed 50 glaucous-winged x western hybrid gull hybrids under a permit from USFWS. The lethal removal lasted from May 5th through June 15th with 40 gulls removed in May and 10 in June. In spite of the removal of predatory gulls in 2012, only approximately 400 Caspian tern fledglings were raised by a colony of approximately 6,400 breeding pairs. It is difficult to predict future Caspian tern production on East Sand Island especially in light of gull depredation on chicks and eggs in recent years, where large colonies on East Sand Island have produced few young.

Climate conditions associated with a strong La Niña and the resultant exceptionally high river flows also apparently contributed to the lack of nesting success by affecting the availability of marine forage fish (Roby et al. 2012 Annual Report). Also, disturbance rate of Caspian terns from bald eagles on East Sand Island has been positively related to May river discharge (Roby et al. 2013), although the R^2 value for this relationship of 0.72 indicates that 28% of the variance of the data could be attributable to other factors. Nesting success has been negatively related to June river discharge (Roby et al. 2013), although the R^2 value in this case was only 0.42. Greater river discharge is thought to negatively affect the availability of marine forage fish (Roby et al. 2011 Annual Report) and decrease water clarity (Hostetter et al. 2012).

Thirteen ESA-listed evolutionarily significant units (ESUs) comprising 5 species of Columbia River Basin salmonids occur in the Columbia River Estuary (Table 2).

Table 2. ESA statuses and juvenile migration strategy of the 13 ESUs occurring in the Columbia River Estuary.

Evolutionarily Significant Unit	Status	Juvenile Migration Strategy
Chinook Salmon		
• Upper Columbia River Spring Run • Lower Columbia River • Upper Willamette River • Snake River Spring/Summer Run • Snake River Fall Run	Endangered Threatened Threatened Threatened Threatened	Yearling Sub-yearling Yearling Yearling Sub-yearling
Coho Salmon		
• Lower Columbia River	Threatened	Yearling
Chum Salmon		
• Columbia River	Threatened	Sub-yearling
Sockeye Salmon		
• Snake River	Endangered	Yearling
Steelhead		
• Upper Columbia River	Threatened	Yearling

• Middle Columbia River	Threatened	Yearling
• Lower Columbia River	Threatened	Yearling
• Snake River	Threatened	Yearling
• Upper Willamette River	Threatened	Yearling

Predation on juvenile salmonids from avian predators is listed as one of the factors potentially limiting the recovery of Columbia Basin salmonid runs (NMFS 2008). Under the Proposed Action, the acreage for the Caspian tern colony on East Sand Island would be reduced by 0.5 acre, from 1.58 acres to 1.08 acres (a 31.6% reduction in nesting area). This is desired because of the unexpected high densities of nesting Caspian terns on East Sand Island in 2013 and is seen as a corrective measure to alleviate predation on juvenile salmonids, in the long term, and undesired expansion of the Caspian tern population in the Columbia River Estuary in future years. As noted above, East Sand Island is the largest Caspian tern nesting colony in the world and is abnormally large for this species.

As noted above, peak occurrence of juvenile salmonids in the Columbia River Estuary on their migration to the ocean occurs from April to July, which coincides with the nesting season of Caspian terns on East Sand Island (Figure 7 and 9). Of the 5 species of ESA-listed salmonids in the Columbia River Estuary, steelhead, coho, and Chinook are most susceptible to predation from the East Sand Island tern colony based on numbers of individuals taken (Figure 10).

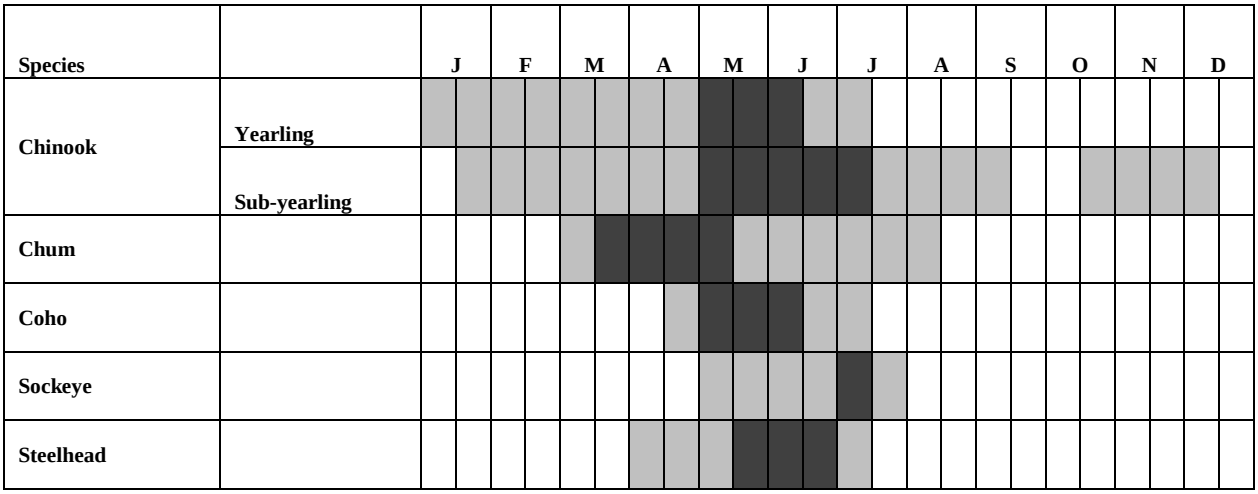

Figure 9. Migration timing of juvenile salmon and steelhead (stock composite) in the lower Columbia River (based on Dawley et al. 1986; data gaps for sub-yearling Chinook in mid-September to mid-October and mid-December to mid-January are due to no sampling efforts). Dark shading represents peak (high abundance) migration/rearing and light shading represents non-peak (lower abundance) migration/rearing.

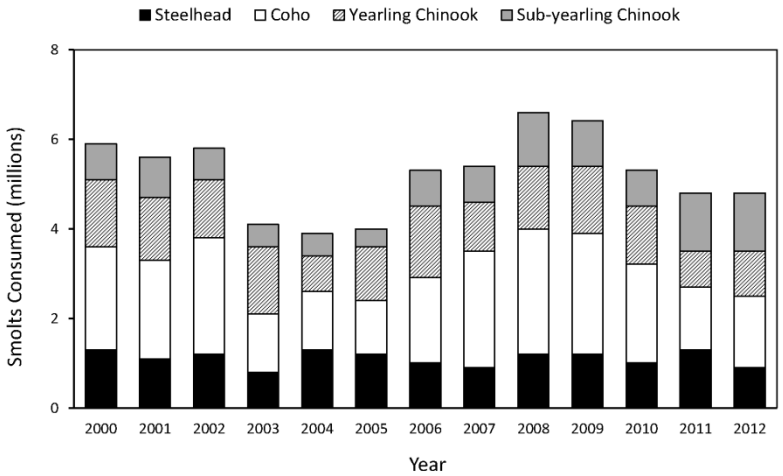

Figure 10. Estimated total annual consumption of steelhead, coho, and Chinook by Caspian terns nesting on East Sand Island during the 2000-2012 nesting seasons. Estimates based on fish collected from tern bill loads near the colony and bioenergetics calculations (Roby et al. 2012 Annual Report).

It is interesting that chum salmon appear to not to be susceptible to Caspian tern predation. This may be related to the small size of juveniles occurring in the estuary; chum salmon outmigrate shortly after hatching; Hostetter et al. (2012) found that size (fork length) was an important factor in susceptibility of juvenile steelhead to Caspian tern predation (Figure 11). Peak susceptibility was at a fork length of 202 mm (20.2 cm) and decreased in larger and smaller fish. Also note from Figure 10 that during most years, smaller sub-yearling Chinook salmon were less prevalent in the Caspian tern diet than the larger yearling Chinook.

Juvenile salmonid consumption by Caspian terns has remained fairly constant for the East Sand Island colony since the year 2000 (Figure 12). One possible explanation for the rather static consumption totals is that nesting birds that have lost eggs or chicks remain in the estuary and use East Sand Island for roosting; so recent years when gull predation has had a large impact on terns fledged, smolt consumption has still been high. The result of no gull predation and large numbers of terns fledged would, however, tend to increase smolt consumption because of greater amounts of food required when raising young. Consumption of juvenile salmonids, however, has been far less than pre-year 2000 when the Caspian tern colony in the estuary was upstream at Rice Island because of greater species diversity of available fish lower in the estuary (see Figure 2 also). Yearly consumption of juvenile salmonids by Caspian terns averaged over 10 million when the colony was located at Rice Island.

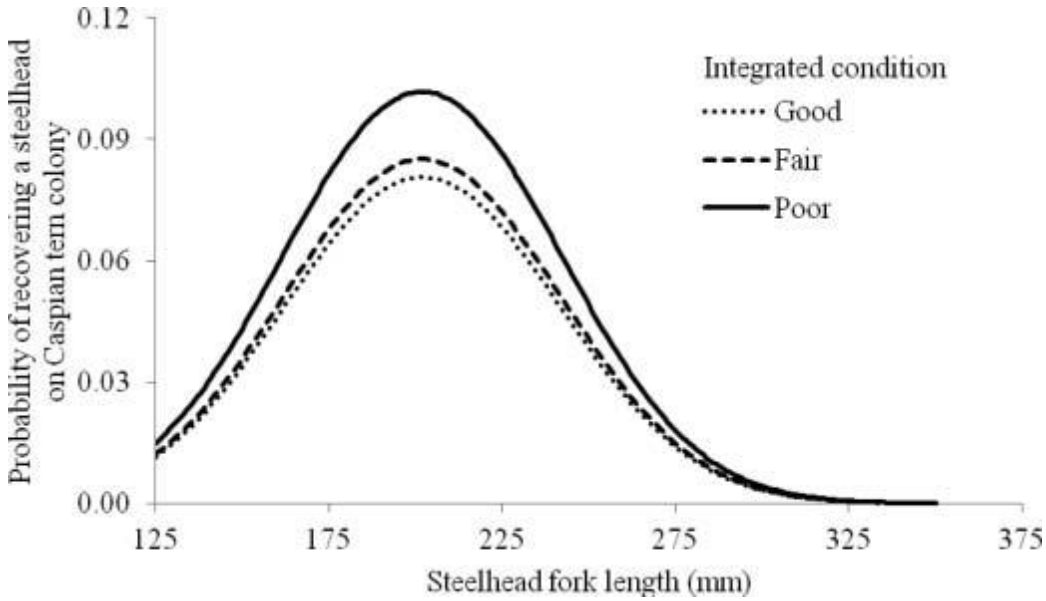

Figure 11. The effect of steelhead size on susceptibility to Caspian tern predation in the vicinity of the confluence of the Columbia and Snake Rivers (Hostetter et al. 2012).

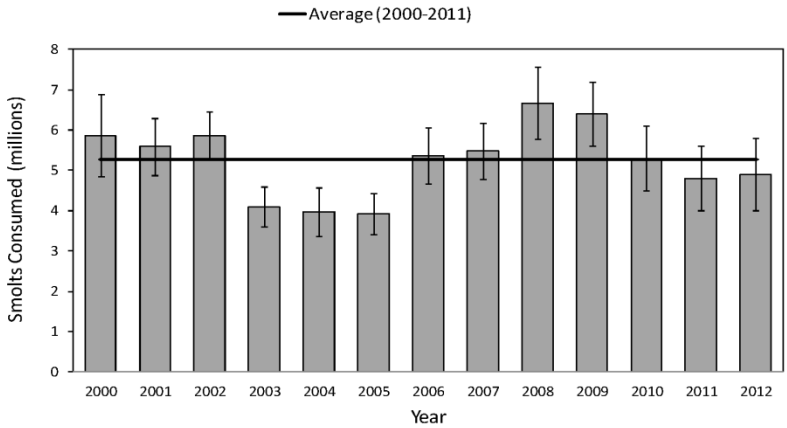

Figure 12. Estimated total annual consumption of smolts (juvenile salmonids) by Caspian terns nesting on East Sand Island in the Columbia River Estuary during the 2000-2012 breeding seasons. Estimates are based on fish identified in tern bill loads on-colony and bioenergetics calculations (Roby et al. 2012 Annual Report). Data for 2013 not yet available but estimate was near 4.7 million smolts consumed (Roby et al. 2013). The error bars represent 95% confidence intervals.

It is assumed that the number of Caspian Terns returning to East Sand Island in 2014 would be large enough to occupy the 1.08 acres of nesting habitat at the density observed in 2013. It is also assumed that enough Caspian terns would be present in 2014 to nest at higher densities than observed in 2013; whether or not they would nest at higher densities on East Sand Island than observed in 2013 is unknown; they may since even higher nesting densities have occurred inland at Crump Lake (Roby et al. 2012 Annual Report).

Cuthbert (1988) showed that Caspian terns on islands in Lake Michigan were less likely to return to a nesting colony if nesting had been unsuccessful the previous year. Recent low nesting success, and complete failure of the colony in 2011, has not deterred Caspian terns from returning to the East Sand Island colony, however.

The density of Caspian terns nesting on East Sand Island in 2013 was approximately 1.2 nests per square meter resulting in approximately 7,600 nests, the highest density ever observed in the Columbia River Estuary (Roby et al. 2013) (Figure 13). If nesting occurs at this density in 2014 over 1.08 acres, approximately 5,200 nests would result. This is approximately 66% more pairs than the high end of the range identified in the FEIS/ROD of 3,125. It is expected that some of the returning Caspian terns that would not be able to nest at the East Sand Island colony because of unavailable space would attempt to nest elsewhere in the Columbia River Estuary as they have done in past years; especially upstream at Rice Island, the main nesting colony site prior to movement of terns to East Sand Island. Terns may also attempt to nest along the eastern shore of East Sand Island as they have done in the past. Continued hazing, potentially more intense than in the past, where necessary under the Proposed Action would be expected to alleviate this problem to a large extent; hazing during previous years has been successful.

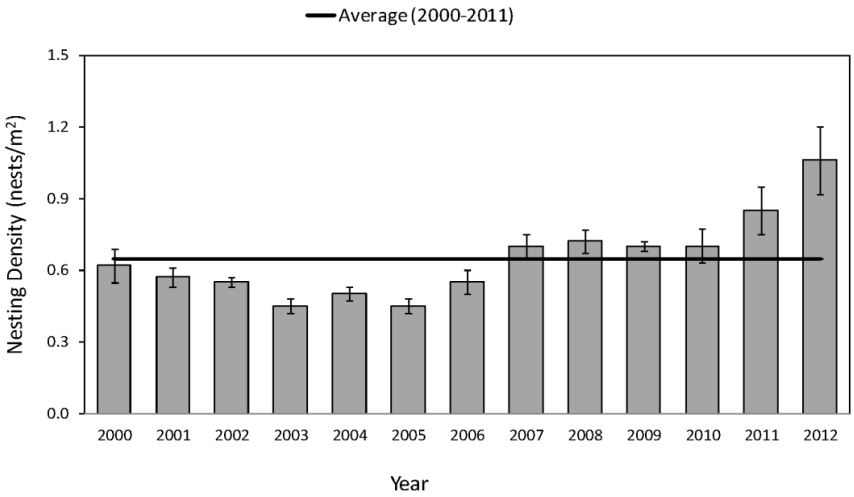

Figure 13. Nesting density of Caspian terns on East Sand Island (Roby et al. 2012 Annual Report). Data for 2013 not yet available, but estimate was near 1.2 per m^2 (Roby et al. 2013). The error bars represent 95% confidence intervals.

Reducing nesting area on East Sand Island prior to the 2014 nesting season is not predicted to reduce predation on juvenile salmonids in the Columbia River Estuary in 2014. With reduction of the nesting area, predation on juvenile salmonids could, conceivably, increase in 2014 with implementation of the Proposed Action compared to the No Action Alternative resulting from use of upstream areas of some of the excess terns that would not be able to nest on East Sand Island because of limited space. The diet of terns using upstream areas such as Rice Island, Pillar Rock Island, and Miller Sands Spit would tend to include greater percentages of juvenile salmonids than birds nesting at

East Sand Island and foraging closer to the island because of the scarcity of marine forage fish such as anchovy, herring, and smelt at upstream locations; intense predation on juvenile salmonids, as described earlier, was the reason for relocation of the Caspian tern colony from Rice Island to East Sand Island. Non-nesting terns are expected to eat less, however, than nesting terns that are feeding young; but a non-nesting tern foraging in the vicinity of Rice Island, for example, may consume more juvenile salmonids than a nesting bird at East Sand Island. Roby et al. (2002) showed that the diet of Caspian terns nesting on Rice Island in 1999 and 2000 comprised 77% and 90% juvenile salmonids, respectively. Conversely, diets of Caspian terns nesting on East Sand Island have been, on average since colony establishment, comprised of approximately 31% juvenile salmonids (Roby et al. 2012 Annual Report). Recent hazing efforts have been necessary on Rice Island, as terns have attempted to nest, but not on Pillar Rock Island or Miller Sands Spit (Roby et al. 2012 Annual Report). In 2012, dredged material placed on Miller Sands Spit was contoured to establish mounds to reduce sight distance of terns on the ground and prevent nesting.

While a decrease in predation on juvenile salmonids may not be realized in 2014, the goal of reducing nesting area on East Sand Island is long term maintenance of the Caspian tern population in the Columbia River Estuary in order to benefit ESA-listed salmonids, and is a corrective measure to account for unexpectedly higher nesting density on East Sand Island. This corrective measure is needed to address the guiding principles identified in the 2005 EIS, specifically points 3 and 5: “Management actions will be implemented to ensure terns remain a viable and integral part of the estuarine, coastal, and interior ecosystems of the Pacific Coast region, including the Columbia River Estuary, in a manner consistent with salmon recovery” (point 3); and “Management actions will be implemented to ensure the recovery of ESA-listed salmonids is not impeded by tern predation” (point 5). Implementation of the Proposed Action is predicted to have benefits to ESA-listed salmonids in the long term by reducing predation from Caspian terns by adjusting the East Sand Island Caspian tern colony size and producing less young that could return to the estuary. This change in nesting area would be in response to unexpected high nesting densities, to an area aimed to address management objectives with respect to numbers of nesting terns.

Pacific eulachon, a species of smelt and often referred to as “smelt”, migrate upstream in the Columbia River to their spawning grounds mainly in the Lewis and Cowlitz Rivers of Washington and the Sandy River of Oregon. Eulachon are similar to most salmonids in that they are semelparous, dying after spawning, so the concern with respect to predation from Caspian terns would be with fish that are moving upstream. Out-migrating eulachon occur in the larval stage and drift through the Columbia River Estuary typically during spring and would not be susceptible to predation from Caspian terns because of their small size. Eulachon are the only other ESA-listed species besides salmonids that Caspian terns in the lower Columbia River could impact. They migrate close to the water surface in schools and these schools are often followed as they move upriver by predatory birds, especially gulls.

Abundance of migrating adult eulachon in the Columbia River has historically been highly variable (Figure 14). The 2012 ESA listing of the species was in response to low numbers beginning in the early 1990s, but 2013 resulted in a strong run. Caspian terns typically arrive at Oregon colonies in late March and early April (Roby et al. 2003). Freshwater entry of eulachon from the Pacific Ocean and migration through the Columbia River Estuary typically occurs for the most part before Caspian terns would arrive in the Columbia River Estuary (Figure 15); during most years, it would be expected that there would be no Caspian tern predation on eulachon. Entry into freshwater appears to be mainly dependent on water temperature with upstream migration typically occurring during winter, often in early to mid-January (ODFW and WDFW 2009).

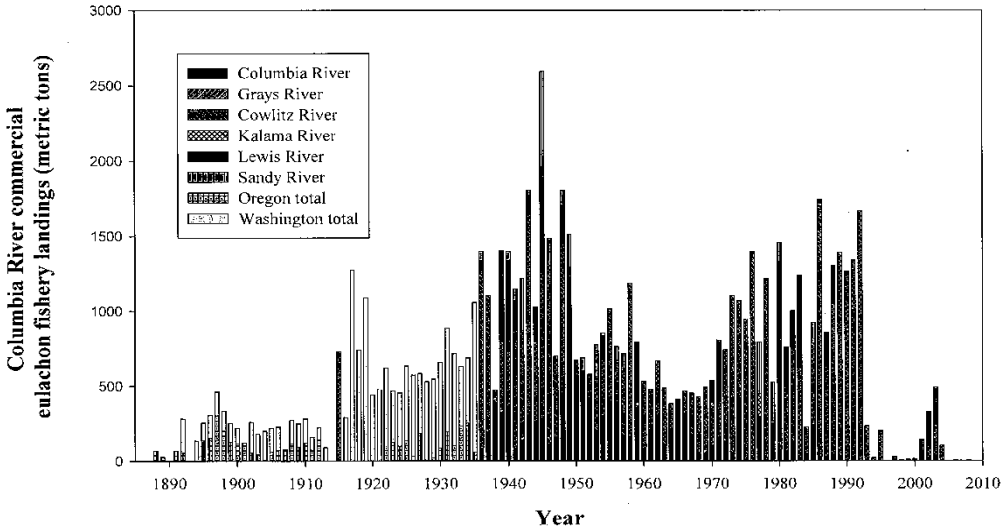

Figure 14. Eulachon commercial catch, an indicator of relative abundance among years, in the Columbia River Basin (NMFS 2010).

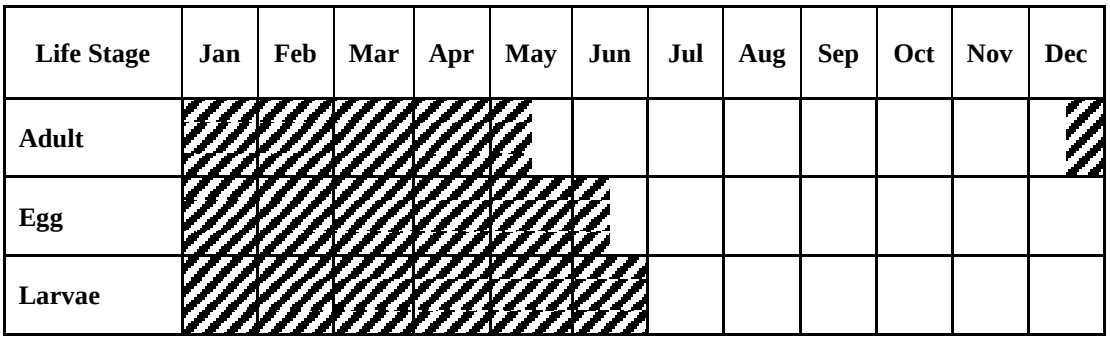

Figure 15. Pacific eulachon presence by life stage in the lower Columbia River (Corps et al. 2013).

Adult eulachon are usually of appropriate size to be taken by Caspian terns. In San Francisco Bay, Caspian terns fed exclusively on fish that were 8-23 cm (80-230 mm) in length (Roby and Collis unpublished data cited in Strong et al. 2003) and in the Columbia

River predation susceptibility peaked at 20.2 cm (202 mm) (Figure 11); adult eulachon range in size from 14-30 cm (140-300 mm) (Hart and McHugh 1944).

Caspian terns in the Columbia River Estuary could prey upon eulachon, especially during years when eulachon entry into the Columbia River occurs later than typical. Migratory timing of eulachon and arrival of Caspian terns in the Columbia River Estuary, however, typically do not overlap but could during some years. Implementation of the Proposed Action would tend to reduce Caspian tern predation on eulachon in the long term by adjusting the East Sand Island colony size, in response to unexpected high nesting densities, to an area aimed to meet management objectives with respect to numbers of nesting terns.

Reduction in nesting area on East Sand Island is expected to result in movement in future years of some terns that would have returned to East Sand Island. In 2013, approximately 680 Caspian terns moved from East Sand Island to some of the constructed inland sites, including Summer Lake, Malheur Lake, Crump Lake, Sheepy Lake, and Tule Lake (Roby et al. 2013). Based on banding data, it is thought that Caspian terns that are not actively nesting (either have not started nesting, have finished nesting, or have failed nesting) are free to move around within the year. Wandering probably plays an important role in assessing other nesting and foraging opportunities. Since Caspian terns are long-lived and have evolved with ephemeral nesting habitat, wandering to other areas is probably advantageous (personal communication with Donald E. Lyons, Oregon State University). As described earlier, the Caspian Tern Plan called for redistribution of approximately 60% of the East Sand Island colony population via construction of new habitat (islands) in Oregon, California, and Washington. Additional movement of Caspian terns out of the Columbia River Estuary to these inland locations in future years will aid in Columbia Basin salmonid recovery because these stocks of course do not occur at the inland lake locations.

Food habits of Caspian terns at the inland locations include crappie (including white crappie) , bass, catfish, chub (including Tui chub), minnows, carp, rainbow trout, Sacramento perch, and Klamath largescale sucker, none of which are ESA-listed. Predation on ESA-listed species is not too much of a concern at the inland locations; the only ESA-listed species observed to be preyed upon by Caspian terns was an individual Warner sucker at Crump Lake in 2008 (Roby et al. 2012 Annual Report).

No Action Alternative:

Keeping the East Sand Island Caspian tern colony size at 1.58 acres would allow for more nesting terns than is desired. The Caspian Tern Plan targeted 2,500 to 3,125 nesting pairs on East Sand Island. As noted earlier, acreages of nesting habitat were established based on predicted nesting density, but densities on East Sand Island have been higher than expected; approximately 7,600 nesting pairs were present on the island in 2013.

Continuing current management under the No Action Alternative is predicted to result in greater numbers of Caspian terns in the Columbia River Estuary compared to

implementation of the Proposed Action, and resultant greater impacts in the long-term to ESA-listed salmonids and eulachon through increased predation.

Eulachon, however, in typical years migrate upstream earlier than the arrival of Caspian terns in the Columbia River Estuary. The No Action Alternative would not be expected to change the average arrival time of Caspian terns to the Columbia River Estuary but, since more terns would be expected than with implementation of the Proposed Action, more terns would be expected to be present earlier in the spring. Therefore, more eulachon predation by Caspian terns would be expected with the No Action Alternative than with implementation of the Proposed Action.

Fish and Wildlife (non-Federally listed):

Proposed Action: Implementation of the Proposed Action would be considered a corrective measure to prevent the potential for undesired population expansion of Caspian terns in the Columbia River Estuary, and resultant increased predation on juvenile ESA-listed salmonids. It is difficult, however, to predict Caspian tern production on East Sand Island especially in light of gull depredation on chicks and eggs in recent years, where large colonies on East Sand Island have produced few fledglings. The Proposed Action would be implemented with the goal of controlling the population of Caspian terns in the Columbia River Estuary. Non-federally listed fish species upon which Caspian terns prey in the lower Columbia River Estuary in the vicinity of East Sand Island and the ocean include anchovy, herring, surfperch, Pacific sand lance, and smelt. Longfin smelt and surf smelt are likely more prevalent in the diet than eulachon (which is a type of smelt) because they are present in the estuary throughout the Caspian tern nesting season; Bottom et al. (1984) found that longfin smelt and surf smelt were represented in the estuary consistently during spring high and summer low flow periods.

With implementation of the Proposed Action, the aim would be to stabilize the Caspian tern nesting population in future years. This would tend to lessen predation on non-federally-listed fish in the long term compared to the No Action Alternative, which would allow more nesters on East Sand Island. However, Caspian tern predation on non-federally-listed fish in the Columbia River Estuary is not a concern from the standpoint of the health of those populations.

No impacts to other piscivorous birds are expected. Bald eagles and Calfornia brown pelicans are both piscivorous and were both formerly listed under ESA. Bald eagles nest and are permanent residents in the Columbia River estuary. They prey primarily upon waterfowl and large fish; the size of fish they take are typically larger than Caspian tern prey. California brown pelicans forage on fish of similar size to Caspian tern prey as described later. They typically arrive in the Columbia River Estuary in late summer and fall as post-breeding dispersers from the south and can overlap temporally with Caspian terns; the availability of forage fish, however, is not believed to be a limiting factor for piscivorous birds in the Columbia River Estuary.

No Action Alternative: With the No Action Alternative, maintaining 1.58 acres of nesting habitat on East Sand Island would allow more Caspian terns to nest in the future compared to the Proposed Action and would likely increase numbers of terns returning to nest. This would tend to increase predation on non-federally-listed fish in the long term compared to the Proposed Action. Non-federally-listed fish most susceptible to tern predation include anchovy, herring, surfperch, and smelt. However, Caspian tern predation on non-federally-listed fish in the Columbia River Estuary is not a concern from the standpoint of the health of those populations.

Vegetation:

Proposed Action: With implementation of the Proposed Action, vegetation would be allowed to grow back within the 0.5 acre of area that would be removed from the Caspian tern nesting area on East Sand Island. It would take about 3 years to fully revegetate. This vegetation would consist mostly of non-native European beach grass, and would prevent nesting of Caspian terns.

No Action Alternative: With the No Action Alternative, vegetation on East Sand Island would continue to be maintained, with 1.58 acres being disked annually to support nesting of Caspian terns.

Ground Disturbance:

Proposed Action: With implementation of the Proposed Action, the area removed from the nesting acreage (0.5 acre) would no longer be disked annually.

No Action Alternative: No changes to ground disturbance would result from the No Action Alternative. The entire current Caspian tern nesting area (1.58 acres) on East Sand Island would continue to be disked annually before nesting begins in March.

Cultural Resources:

Proposed Action:

No impacts to cultural resources are expected with implementation of the Proposed Action. Annual ground disturbance would cease over 0.5 acre of the current East Sand Island Caspian tern nesting colony, which is located on previously placed dredged material. Dissuasion material may be needed on the east shore of the island as, in years past; this area however is low-lying and subject to erosion/deposition and not expected to yield cultural resources. A pedestrian cultural resource survey occurred during January, 2014 with a report due in February 2014. The Final EA would report on the results of the survey as they pertain tern any changes to tern management.

No Action Alternative:

No impacts to cultural resources are expected with the No Action Alternative. Annual ground disturbance would continue over 1.58 acres of the current East Sand Island Caspian tern nesting colony which, as noted above, is located on previously placed dredged material. Dissuasion material may be needed on the east shore of the island as, in years past; this area however is low-lying and subject to erosion/deposition and not expected to yield cultural resources. A pedestrian cultural resource survey occurred during January, 2014 with a report due in February 2014. The Final EA would report on the results of the survey as they pertain tern any changes to tern management.

Land Use:

Proposed Action: With implementation of the Proposed Action, 0.5 acre of land on East Sand Island would be allow to revegetate and would not be used by Caspian terns for future nesting.

No Action Alternative: No changes to land use would result from the No Action Alternative. A total of 1.58 acres of nesting habitat for Caspian terns would remain available on East Sand Island.

Environmental Justice:

Proposed Action: Implementation of the Proposed Action would not adversely affect any particular group of people to a greater extent than other groups, as all work would occur on public land. No private property would be impacted from implementation of the Proposed Action.

No Action Alternative: No changes regarding environmental justice would result from the No Action Alternative. There are no issues with environmental justice with management for Caspian terns on East Sand Island.

Recreation:

Proposed Action: Managed recreation doesn’t occur on East Sand Island. Occasional boaters and fishers that may use the island. Implementation of the Proposed Action would not impact any recreation that might occur on the island.

No Action Alternative: Managed recreation doesn’t occur on East Sand Island. Occasional boaters and fishers that may use the island. The No Action Alternative would not impact any recreation that might occur on the island.

CUMULATIVE EFFECTS

Cumulative effects are caused by the aggregate of past, present, and reasonably foreseeable future actions (Bass et al. 2001). This EA considers the contributions of these actions, combined with the Proposed Action and with the No Action Alternative, on cumulative effects to the natural resources that could affect the quality of the human environment. The area of consideration is the Columbia River Estuary (from the downstream end of Puget Island to the ocean).

Actions considered in the context of cumulative effects in this EA include the following:

- Past Actions: Lethal take of glaucous-winged x western gull hybrids.

- Present Actions: Hazing in the Columbia River Estuary as needed; management of inland Caspian tern nesting locations; reduction in nesting habitat in Columbia River Estuary.

- Reasonably Foreseeable Future Actions: Reduction in numbers of nesting pairs of double-crested cormorants on East Sand Island; creation or enhancement possible at Don Edwards National Wildlife Refuge in California.

Proposed Action

Direct Effects on Birds

Reducing the East Sand Island Caspian tern colony acreage by implementation of the Proposed Action would not impact ring-billed gulls or hybrid gulls, except that fewer ring-billed gulls may nest within the confines of the prepared habitat. Ring-billed gulls are common and have a broad distribution in North America (Butler 2003). Reducing the acreage of prepared habitat and allowing encroachment of vegetation could possibly benefit ring-billed gulls; Hayward (1993) showed that ring-billed gulls in Washington had better nesting success when nests were located in tall grass.

Reducing acreage would not impact nesting of double-crested and Brandt's cormorants as these two species nest on the other side (west side) of East Sand Island and are separated from the Caspian tern colony by dense shrubbery. While Caspian terns have attempted to nest on East Sand Island outside of the designated colony, this has been done on the east shore of the island (near the Caspian tern colony).

An increased amount of hazing would likely be needed, at least in 2014, with implementation of the Proposed Action. One death of a California brown pelican was documented when the bird got tangled in hazing material on East Sand Island. Although this is likely an unusual occurrence, increased hazing efforts involving placing more hazing material, such as ropes and flags, would pose increased risk for entanglement of birds in hazing material.

Indirect Effects on Birds

Nesting by double-crested cormorants on East Sand Island was first recorded in 1989, when 90 active nests were detected at the western tip of the island; since then the colony has grown to over 13,000 breeding pairs. Amidst the double-crested cormorant colony, a small colony of over 1,000 Brandt's cormorants has developed. There is also a large colony of over 5,000 glaucous-winged x western gull hybrids that has developed over the past 25 years, and more recently a colony of about 1,700 ring-billed gulls. As described earlier, glaucous-winged x western gull hybrids have predated Caspian tern chicks and eggs but ring-billed gulls are smaller and have not posed a threat; Caspian terns and ring-billed gulls have nested amid each other at East Sand Island. Nearly 17,000 California brown pelicans have been observed roosting on East Sand Island, mostly during late summer and early fall (as post-breeding dispersers from the south). None of these species are listed under ESA.

Indirect Effects on Fish

Of the piscivorous birds other than Caspian terns occurring in large numbers on East Sand Island, cormorants are known to be significant predators on juvenile salmonids. California brown pelicans feed primarily on northern anchovy, at least in the California Current system (Anderson and Gress 1982) but are opportunistic feeders (Anderson and Anderson 1976). Pacific herring and Pacific sand lance were found to be the most common species taken near Vancouver Island, British Columbia (Burger et al. 1998). These three species of fish often taken by California brown pelicans are commonly similar in size to juvenile salmonids in the Columbia River Basin; northern anchovy (~17.8 cm, 178 mm), Pacific herring (~25 cm, 250 mm), and Pacific sand lance (~20 cm, 200 mm) (Hart 1973). California brown pelicans often take multiple fish on single dives into the water from flight and tend to concentrate on schools of fish. Also, they occur in the Columbia River Estuary typically after most juvenile salmonids have moved to the ocean. Therefore, it is unlikely that California brown pelicans prey heavily on juvenile salmonids when occupying East Sand Island. Gulls, in general, have a varied diet and are not considered a problem with predation on juvenile salmonids in the Columbia River Estuary.

An EIS is currently being prepared by the Corps for management of cormorants on East Sand Island, with the intent of reducing the number of cormorant nesters in order to benefit Columbia River Basin salmonid populations. On East Sand Island, double-crested cormorants nest in larger numbers and consume more juvenile salmonids than do Caspian terns. Unlike Caspian terns, cormorants are not susceptible to huge nesting failure resulting from disruption of the colony by bald eagles and hybrid gulls. Double-crested cormorants have averaged over 10,000 nesting pairs on East Sand Island since 1997 (Figure 16) and have consumed over 18 million juvenile salmonids during recent nesting seasons (Figure 17).

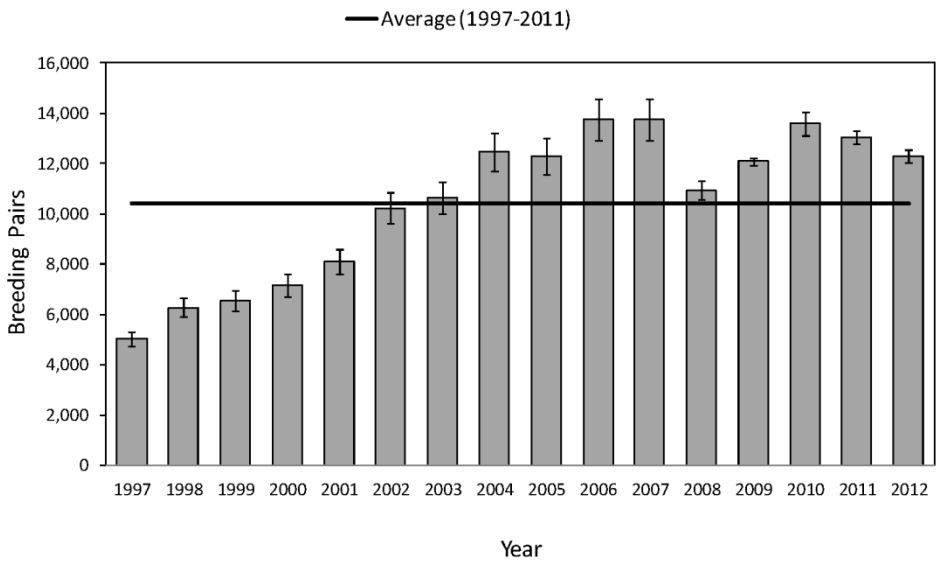

Figure 16. Number of breeding pairs of double-crested cormorants on East Sand Island (Roby et al. 2012 Annual Report). Data for 2013 not yet available. The error bars represent 95% confidence intervals.

A noteable difference exists when comparing juvenile salmonid composition in the diets of Caspian terns to double-crested cormorants: Sub-yearling Chinook salmon are very prevalent in the diets of double-crested cormorants (Figure 17) but not in the diets of Caspian terns (Figure 10); yearling Chinook salmon are more prevelent than sub-yearlings in the diets of Caspian terns. Although double-crested cormorants are larger than Caspian terns, it could be that cormorants are less size-specific with respect to prey than are Caspian terns and forage on smaller fish moreso than terns. Sub-yearling Chinook salmon tend to be smaller than prey more commonly captured by Caspian terns. Double-crested cormorants dive from a resting position on the water surface and are capable of deep diving while Caspian terns dive into the water from flight and are only capable of capturing prey that is near the water surface. It is doubtful though that the difference in capture of sub-yearling Chinook salmon is attributable to depth of occurrence; Emmett et al. (2004) showed that sub-yearlings were common in surface trawl catches in the Columbia River Plume.

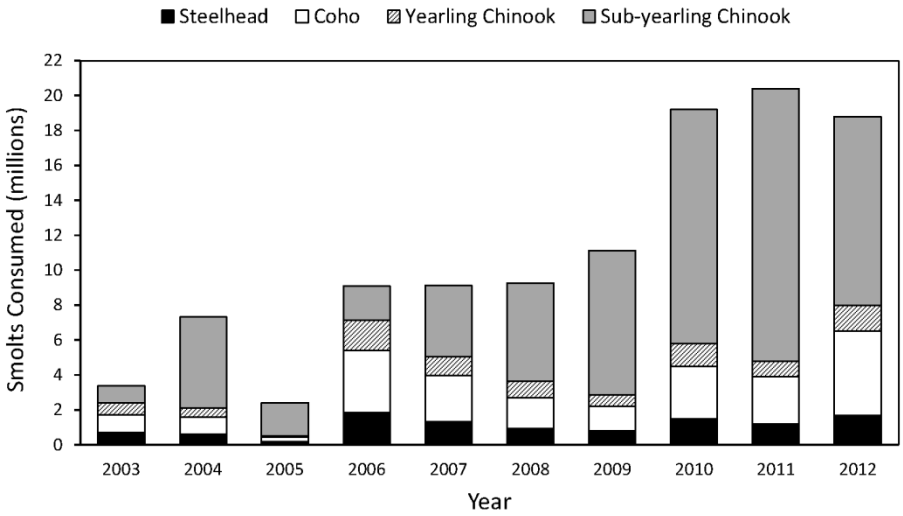

Figure 17. Estimated total annual consumption of steelhead, coho, and Chinook by double-crested cormorants nesting on East Sand Island during the 2003-2012 nesting seasons. Estimates based on fish identified in foregut samples and bioenergetics calculations (Roby et al. 2012 Annual Report). Data for 2013 not yet available.

Like Caspian terns, double-crested cormorants utilize a diversity of prey in the Columbia River Estuary (Figure 18) but appear to utilize a more diverse prey base than Caspian terns including minnow, carp, sculpin, flounder (starry flounder is common in the estuary), and stickleback (three-spine stickleback is common in the estuary). This is likely because of the ability of double-crested cormorants to use the entire water column when foraging; they are even able to take benthic species such as flounder and sculpin. As noted above, double-crested cormorants dive from a resting position on the water surface and are capable of deep diving while Caspian terns, similar to California brown pelicans, dive into the water from flight and are only capable of capturing prey that is near the water surface.

For evaluation in this EA, it is assumed that the hazing program that is conducted under the BiOp for maintenance dredging on the Columbia River would be able to prevent nesting of what would likely be a larger number of Caspian terns in the estuary in 2014 than in previous years.

Implementation of the Proposed Action in conjunction with the reasonably foreseeable future actions of reducing size of the cormorant colony and relocating some birds to Don Edwards National Wildlife Refuge is predicted to result in less avian predation on salmonids in the Columbia River Estuary in future years. Proportions of fish species taken in general (Figures 2 and 18) and for salmonids specifically (Figures 10 and 17) would be expected to remain fairly constant and only fluctuate as fish numbers fluctuate, while numbers taken for each fish species would be expected to decrease proportionately with reduction of numbers of terns and cormorants in the Columbia River Estuary in future years.

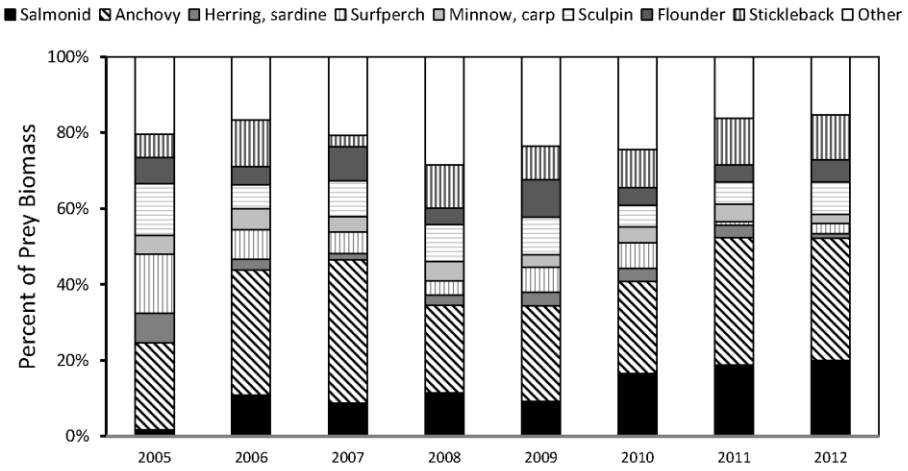

Figure 18. Annual diet composition (percent of prey items) of double-crested cormorants nesting on East Sand Island during 2005-2012 nesting seasons based on fish identified in foregut samples (Roby et al. 2012 Annual Report). The varied diet is attributable to the close proximity of East Sand Island to the ocean and the ability of cormorants to forage throughout the water column. Data for 2013 not yet available.

With implementation of the Proposed Action, an increase in nesting Caspian terns would be expected at the inland nesting locations along with an increase in predation on fish available there. As described earlier, the population viabilities of these fish are not of concern except for the ESA-listed Warner sucker. As described earlier, only 1 individual Warner sucker has been noted as prey upon by Caspian terns, in 2008. Increased numbers of Caspian terns nesting at the inland locations would increase the likelihood of future predation on the Warner sucker, but is not seen as a great concern given the scarcity of observed predation on this fish.

COORDINATION

This EA was prepared to address the requirements of the National Environmental Policy Act (NEPA) and has been issued for 30-day public and agency review under Public Notice CENWP-PM-E-14-02. This EA was sent to government agencies and other groups. Government agencies included U.S. Environmental Protection Agency, U.S. Forest Service, U.S. Bureau of Land Management, National Marine Fisheries Service, U.S. Fish and Wildlife Service, Oregon Department of Fish and Wildlife, and Oregon Department of Environmental Quality.

Public comments will be addressed. After consideration of all public comments, if it is determined that the Proposed Action would have no significant impact on the quality of the human environment, then a Final EA, incorporating the responses to comments, and a Finding of No Significant Impact (FONSI) will be signed which will conclude the NEPA process. If it is determined that the Proposed Action would have a significant impact on the quality of the human environment, then further consideration under NEPA will occur.

REQUIREMENTS WITH LAWS AND EXECUTIVE ORDERS

a. National Environmental Policy Act: This Draft EA is in compliance with the requirements of the National Environmental Policy Act. This Draft EA addresses potential impacts of project alternatives and solicits comments from the public and government agencies to aid in the determination of the significance of the proposed project to the quality of the human environment.

b. Endangered Species Act: The focus of this Draft EA is mainly concerned with reducing Caspian tern colony size to benefit ESA-listed salmonids by reducing predation on juveniles in the long term. The proposed action is intended to address salmonid recovery in the Columbia River Basin in accord with the existing BiOp. No consultation is being pursued with National Marine Fisheries Service for implementation of the Proposed Action.

c. Clean Water Act: No fill or excavation will occur in wetlands. Nearby waters will not be affected. All work will occur on uplands.

d. Clean Air Act: No emissions would result from implementation of the Proposed Action.

e. Natural Historic Preservation Act: No impacts to cultural resources are expected with implementation of the Proposed Action. Annual ground disturbance would cease over 0.5 acre of the current East Sand Island Caspian tern nesting colony, which is located on previously placed dredged material. Dissuasion material may be needed on the east shore of the island as, in years past; this area however is low-lying and subject to erosion/deposition. A pedestrian cultural resource survey occurred during January, 2014 with a report due in February 2014. The Final EA would report on the results of the survey as they pertain tern any changes to tern management.

f. Native American Graves Protection and Repatriation Act: There are no recorded historic properties within the immediate project area and the probability of locating human remains in the project area is low. If human remains are incidentally discovered during construction, the Corps and/or contractor will be responsible for following all NAGPRA requirements.

g. Coastal Zone Management Act: Not applicable, as the project is not near the coast, and will not affect the coastal zone.

h. Fish and Wildlife Coordination Act: This is not a water-resources project and is not subject to this act.

i. Marine Protection, Research, and Sanctuaries Act: Not applicable.

j. Executive Order 11988, Flood Plain Management: No effect as floodplains in the proposed project area would not be altered.

k. Executive Order 11990, Protection of Wetlands: No wetlands would be affected by construction of the proposed project. All work will occur on uplands.

l. Analysis of Impacts on Prime and Unique Farmlands: Not applicable, as no farmlands are present in the proposed project area.

m. Comprehensive Environmental Response, Compensation, and Liability (CERCLA) and Resource Conservation and Recovery Act (RCRA): There is no indication that any hazardous, toxic and radioactive waste (HTRW) are in the vicinity of the project area. Presence of HTRW would be responded to within the requirements of the law and Corps regulations and guidelines.

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APPENDIX 1

Scientific Names of Animals and Plant Mentioned in Text

Birds

Canada Goose	*Branta canadensis*
Great-horned Owl	*Bubo virginianus*
Streaked Horned Lark	*Eremophila alpestris strigata*
Bald Eagle	*Haliaeetus leucocephalus*
Caspian Tern	*Hydroprogne caspia*
Gull	*Larus* spp.
Ring-billed Gull	*Larus delawarensis*
Glaucous-winged/Western Gull	*Larus glaucescens* x *occidentalis*
Black-crowned Night Heron	*Nycticorax nycticorax*
California Brown Pelican	*Pelecanus occidentalis*
Double-crested Cormorant	*Phalacrocorax auritus*
Brandt's Cormorant	*Phalacrocorax penicillatus*

Fish

Pacific Sand Lance	*Ammodytes hexapterus*
Sacramento Perch	*Archoplites interuptus*
Klamath Largescale Sucker	*Catostomus snyderi*
Warner Sucker	*Catostomus warnerensis*
Bass	Centrarchidae
Pacific Herring	*Clupea pallasii*
Herring	Clupeidae
Sardine	Clupeidae
Shad	Clupeidae
Sculpin	Cottidae
Chub	Cyprinidae
Minnow	Cyprinidae
Carp	*Cyprinus carpio*
Surfperch	*Embiotoca lateralis*
Anchovy	Engraulidae
Northern Anchovy	*Engraulis mordax*
Stickleback	Gasterosteidae
Three-spine Stickleback	*Gasterosteus aculeatus*
Tui Chub	*Gila bicolor*
Surf Smelt	*Hypomesus pretiosus*
Catfish	Ictaluridae
Chum Salmon	*Oncorhynchus keta*
Coho Salmon	*Oncorhynchus kisutch*

Steelhead	*Oncorhynchus mykiss*
Rainbow Trout	*Oncorhynchus mykiss*

Fish (continued)

Sockeye Salmon	*Oncorhynchus nerka*
Chinook Salmon	*Oncorhynchus tshawytscha*
Smelt	Osmeridae
Starry Flounder	*Platichthys stellatus*
Flounder	Pleuronectidae
White Crappie	*Pomoxis annularis*
Longfin Smelt	*Spirinchus thaleichthys*
Pacific eulachon	*Thaleichthys pacificus*

Mammals

Fox	Canidae
Coyote	*Canis latrans*
Opossum	Didelphia virginiana
Skunk	Mustelidae
Mink	*Neovison vison*
Raccoon	*Procyon lotor*

Plant

European Beach Grass	*Ammophila arenaria*